Lightweight Family of Weapons and Ammunition for the Objective Force Warrior

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The Near Term:

Support to Current, Conventional Weapons – Lightweight 5.56mm Ammunition

Lightweight Family of Weapons and Ammunition

Support to Current/Conventional Weapons

M16A2 Rifle

M4 Carbine

XM8 Carbine

Goal:

To develop a lightweight replacement for the M855 for use in current conventional weapons and the XM8

- Potential for > 20% reduction in ammunition weight
- Demonstrate in FY04 and transition to SDD Phase in FY05
- High risk program:
  - Materials properties
  - Propellant volume
  - Extraction and ejection cycle
- Conventional weapon design may require 2 piece cartridge case

Lightweight Family of Weapons and Ammunition

Support to Current/Conventional

Weapons

Accomplishments:

- Formed CRADA with NATEC (formely AMTECH)
- Began modeling of cartridge case/chamber interface using ARL and ARDEC modeling capabilities
- Broad Agency Announcement published, proposals received
- Commenced Design for Six-Sigma project to identify high risk areas and apply risk reduction methodologies
- Completed testing of M4 for M&S temperature inputs
- Conducting market research on polymers with industry and Picatinny Innovation Center (ongoing)

NATEC Hybrid Cartridge Case

The Long Term:

A “Clean Sheet of Paper” Weapon System – Reduced Weight as the Priority

Lightweight Family of Weapons and Ammunition

The mobility and combat effectiveness of today's Infantry Soldiers are limited due to the weight of equipment they carry, which routinely exceeds 90 lbs. Much of this weight is in the weapon and ammunition.

The M249 SAW and its ammunition constitute over 40% of the weight for the Automatic Rifleman.

Lightweight Family of Weapons and Ammunition

Nine Man Squad

Team Leader

XM29 OICW (M4)

Squad Leader

XM8 (M4)

Team Leader

XM29 OICW (M4)

Rifleman

XM29/XM8 (M4)

Automatic Rifleman

Lightweight Machine Gun (M249)

Grenadier

XM8 & GL (M4/M203)

Rifleman

XM29/XM8 (M4)

Automatic Rifleman

Lightweight Machine Gun (M249)

Grenadier

XM8 & GL (M4/M203)

Lightweight Family of Weapons and Ammunition

Lightweight Machine Gun & Ammunition

Requirements:

- Support Army Transformation and OFW
- Maintain lethality & reliability of current light machine gun
- Maximize integration with OFW LTI's for switches, power, aiming, etc

Tech Base Program

- Fully funded FY03-07
- Available for OFW demo in FY06
- TRL 6 and transition in FY07

Lightweight Family of Weapons and Ammunition

Squad Automatic Weapon, M249

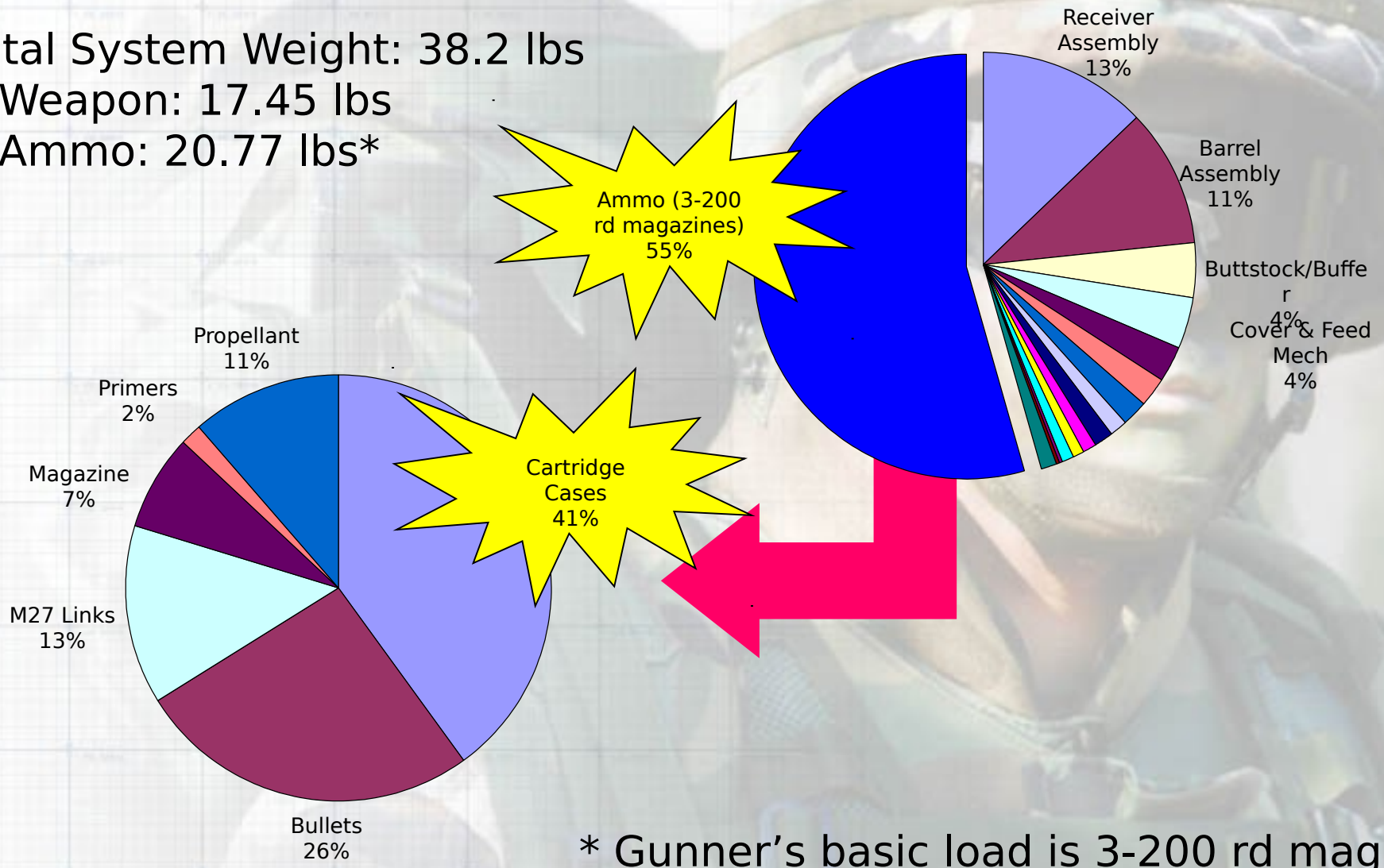
Length: 40.75 inches
Weapon weight w/ bipod: 17.45 lbs
200-round box magazine: 6.92 lbs
Caliber: 5.56 mm

Max effective range: 1000 m (are
Max range: 3600 m
Rates of fire:
Cyclic: 725 rounds per minute
Sustained: 85 rounds per minute

Lightweight Family of Weapons and Ammunition

M249 Weight Allocation

Total System Weight: 38.2 lbs
Weapon: 17.45 lbs
Ammo: 20.77 lbs*



* Gunner's basic load is 3-200 rd magaz

Lightweight Family of Weapons and Ammunition

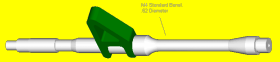
Lightweight Machine Gun & Ammunition

- **Initiate study and design effort FY03**
- **“Clean sheet of paper” effort**
- **Utilize plastic cased or caseless ammunition designs**

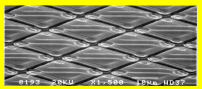
Goals with clean sheet of paper:

- **30% - 35% weapon weight reduction**
- **30% - 40% ammunition weight reduction**
- **30% reduction in volume**
- **Elimination or redesign of links**
- **Modular design, interchangeable components**

Lightweight Barrels

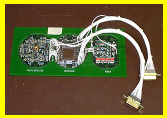


Composite Structures



Caseless or Plastic Cased

Embedded Sensors



Simple Reliable Mechanisms

Lightweight Family of Weapons and Ammunition

Lightweight Machine Gun & Ammunition

Accomplishments:

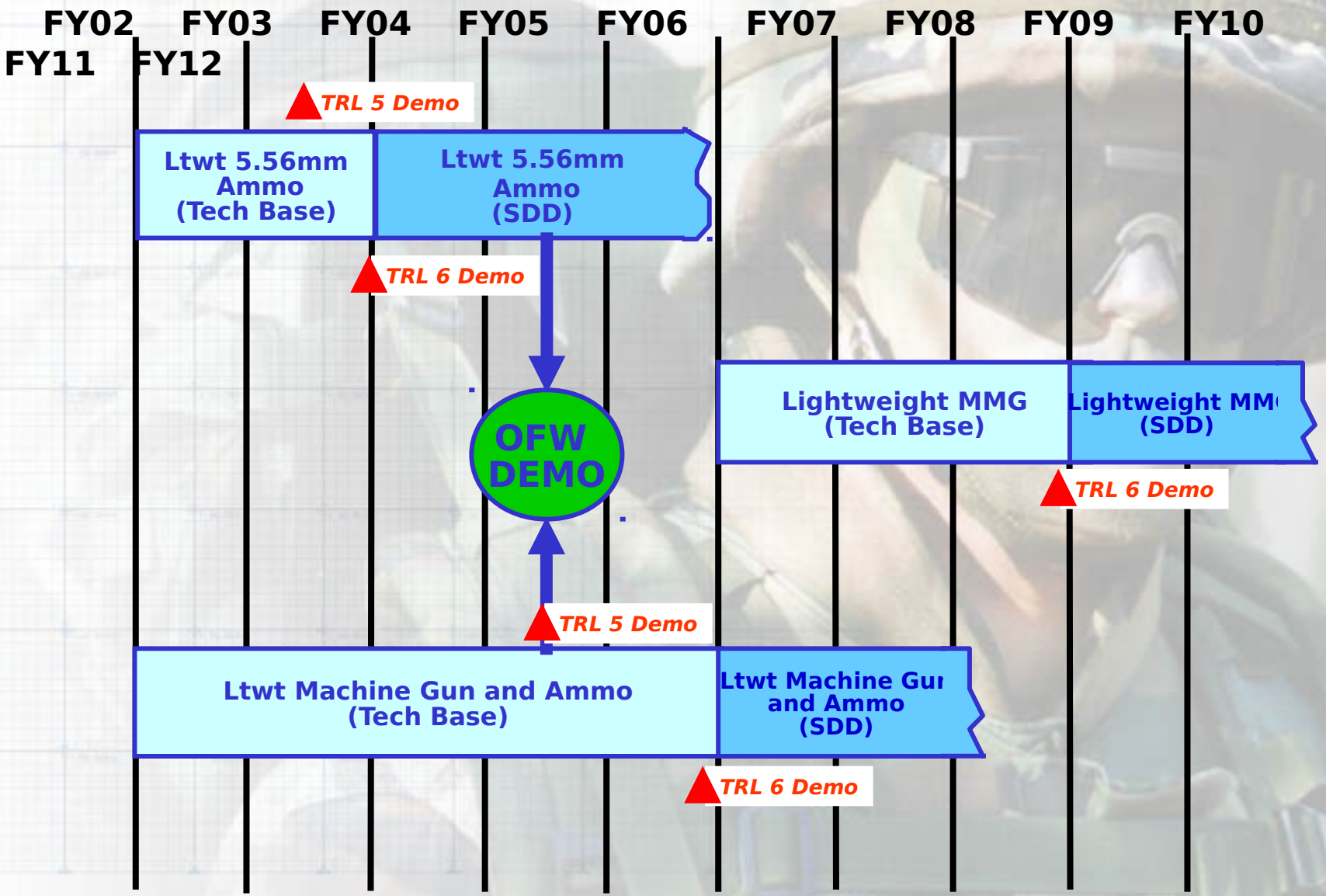
- Quality Function Deployment (QFD):
  - User's Conference held
  - Designer's Conference held
- Broad Agency Announcement published, proposals received
- Proposed STO established as a joint ARDEC/ARL effort
- Contracted report to assess current state of the art for caseless

Plans:

- Award component contracts (May-June)
- Release Systems Integration RFP (August)
- Award 2 System Contracts (January)
  - Phase I (9-12 months)
  - Downselect to one contractor
  - Phase II (~30 months, through FY07)

Lightweight Family of Weapons and Ammunition

Schedule



Lightweight Family of Weapons and Ammunition
Summary

- **Supports FY06 Demonstration of OFW and ATD Exit Criteria**
- **Supports initiatives of PEO Soldier and PM Soldier Weapons**
- **Designed with the *User* in mind via QFD process**
- **Sets the stage for potential future significant weight reductions**
- **Tech base program fully funded and currently undergoing STO review process**

Lightweight Family of Weapons and Ammunition

Quality Function Deployment Conference

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Quality Function Deployment (QFD)

A structured method for quickly and effectively ***Identifying and Prioritizing Customers' Requirements*** then translating those requirements into design concepts.

QFD Conferences

Two QFD conferences conducted:

Conference I – User Conference

Obtain "Voice of the Customer"

Conference II – Designer Conference

Identify Promising Design Concepts

Conference I
User Conference

- **Conducted 17-18 September 2002**

- **Joint User Subject Matter Experts (SME)**
  Army, Navy, Air Force, Marine Corps, and Special Operations Command

Conference I
Problem Statement

SMEs developed consensus on Problem Statement

"Optimize lethality and reduce weapon system weight"

User Conference

"Voice of the Customer" Table

- Addressed roles/needs of platoon members and key support functions
- Information used as reference for developing operational

#	Customer			Use				
		I	E	What	When	Where	Why	How
1	Grenadiers		X	Kill someone (point/area/defilade). KE 0-300 meters.Maneuvarable. Function as a rifle team member.	24/7 while moving	Different positions, ranges and all environments.	Need KE rounds for suppression.	Different positions
2	Automatic Riflemen		X	Suppressing fire and fixing with volume of fire.	24/7 while moving	Different positions. All environments. Range: 0-600 meters point, 800 meters area.	Fix enemy, facilitate maneuvering and prevent enemy from returning fire.	Different positions
3	Squad Leader		X	Direct fire.	24/7 while moving	Different positions. All environments. Engage enemy at point range 0-300 meters.	Control direct firing.	Different positions
4	Anti-Tank Specialist		X	Direct fire.	24/7 while moving	Different positions. All environments. Engage enemy at point range 0-300 meters.	Fix enemy. Maneuvering.	Different positions
5	Asst. Machine Gunner		X	Direct fire.	24/7 while moving	Different positions. All environments. Engage enemy at point range 0-300 meters.	Fix enemy. Maneuvering.	Different positions
6	Machine Gunner		X	Grazing/plunging fire volume at point, area and defilade.	24/7 while moving	Different positions. All environments. Engage enemy at point range 0-600 meters and 800 meters area.	Facilitate maneuvering.	Different positions
7	Platoon Leader		X	Direct fire.	24/7 while moving	Different positions. All environments. Engage enemy at point range 0-300 meters.	Control direct firing.	Different positions
8	Platoon Seargent		X	Direct fire.	24/7 while moving	Different positions. All environments. Engage enemy at point range 0-300 meters.	Control direct firing.	Different positions
9	Radio Operator		X	Direct fire.	24/7 while moving	Different positions. All environments. Engage enemy at point range 0-300 meters.	Fix enemy. Maneuvering.	Different positions
10	Maintainers	X		Do not increase current maintenance burden. Provide modularity and commonality of parts. Round counters on upper and lower assy.	24/7	All environments.	Reduce costs, maximize availability, and reduce logistics footprint.	Operator, unit and organizational.
11	Trainers	X		Interoperability TESS	24/7	All environments.	Reduce costs and facilitate force on force training.	

User Conference
Affinity Diagram

- SMEs brainstormed preliminary requirements, organized into 10 critical categories
  - Each contains sub-elements defining specific parameters

Signature *Reduced Thermal Signature *Flash Reduction *Silencer *Reduced Noise Level (no need for ear plugs) *Stealth	**Sustainability** *Reliability *Maintainability *Simplicity *Sustainability *Dexterity *Self-cleaning (no rust; no carbon build-up) *Smart Chip (accountability) *Packaging Requirements *No-Lube/Dry-Lube/Dry Fire *Minimal Snag Points *Better Sling *30,000 MRBF (Mean Rounds Between Failure) *Weapons Rack (Arms Room Concept) *Self-Test Capability *Pre-packaged Ammo (no magazines to load)	**Modularity** *Common Operations (arming, clearing, feed, selective fire (e.g. auto) *Ambidextrous Extract *LW/OFW Interoperability (thru sensor suites) *Integrated Electronics *Commonality of Parts Common Interface for Accessories (e.g. Rails) *Multi-configurable	**Target Engagement** *Lethality [P(I/h)] (Ammo: terminal effects; accuracy; firing position; target behavior; range; optics; 4 fundamentals BRM) *Terminal Effects of Rounds *3 MOA (minutes of angle) *Max ranges equal or greater than current systems *Optics: 4 X Magnification *Ranging Capabilities *Suppressive Fires *Back-Up functions(e.g. BUIS) *Non-lethal capability (scalable effects *Bayonet
Ruggedness *Waterproof: 2 hours at 2 atmospheres *Environmentals *Airborne Certified *Jump Certified	**Compat. with TADS (Training Aid Devices)** *Training compatibility *Training (Miles, 25 meter “zero-in”, EST/TESS	**Ergonomics** *Low Recoil *Length (<M4 collapsed) *Ergonomics *Firing Position	**Reduced Weight** *Reduced Weapon weight *Lightweight Ammo *Electric Firing Mechanism (e.g. solenoid) *Controllability
Safety *Safety *[illegible]		**Affordability** *Total Operating Costs ($$	

User Conference

Inter-Relationship Digraph

Modularity, Affordability and **Target Engagement** will have greatest impact on achieving goal of reducing weight, increasing lethality

Establish Relationships

Scale:

9 - Strong

3 - Medium

1 - Weak

Depend →

↑

	1. Signature	2. Ergonomics	3. Modularity	4. Compatible with TADS	5. Safety	6. Ruggedness	7. Affordability	8. Reduced weight	9. Target Engagement	10. Sustainability	Total
1. Signature			3	1	1		3		9	1	18
2. Ergonomics	3		9		3	3	9	9	9	3	48
3. Modularity	3	9		3	3	9	9	9	9	9	63
4. Compatible with TADS	9	3	9		3		9		9	3	45
5. Safety	3	9	1			3	3			1	20
6. Ruggedness		3	3		3		9	9	3	9	39
7. Affordability	3	3	9	3	3	9		9	9	9	57
8. Reduced weight	3	9	9		3	9	9		9	3	54
9. Target Engagement	9	9	9	1	1	9	9	9		9	65
10. Sustainability	3	3	9		3	9	9	3	3		42
Total	36	48	**61** ★	8	23	51	**69** ★	48	**60** ★	47	451

User Conference
Requirements Matrix

- **Quality Characteristics evaluated against User requirements**
  - Focus should be on **OFW Interoperability**, **Weapon Weight**, **Environment**, **Common Interface**, **Durability**, **Reliability**, **Multi-Configurable**, and **Human Factors**

Do these...

Help achieve these?

Quality Characteristics (necessary to achieve Requirements)

	Priority	Thermal Signature	Noise Level (to shooter)	Flash Reduction	Passive Detection	Silencer	Recoil	Human Factors	Firing Positions	Portability	LW/OFW Interoperable	Multi-Configurable	Common Interface	Parts Commonality	EST/TESS	Safety Certification	Environmental	Durability	Tot Ownership Costs/ Life Cycle Costs	Ammo Weight	Weapon Weight	Lethality F(t)	Scalable NL Effects	Range	Rate of Fire (Control)	Accuracy F(t)	Back-Up Function	Bayonet	RAM	Round-Counter	Smart Chip	Dry System (no life)	Rel. Log Footprint	Total
Signature	H 9	H 81	H 81	H 81	H 81	H 81	-	-	M 27	-	-	M 27	-	-	-	-	-	-	-	-	-	-	-	-	M 27	-	-	-	-	-	-	L 9	-	495
Ergonomics	H 9	-	H 81	-	-	M 27	H 81	H 81	H 81	H 81	M 27	M 27	M 27	-	-	M 27	-	M 27	-	H 81	H 81	-	-	-	M 27	-	-	-	-	-	-	-	-	756
Modularity	H 9	-	-	-	-	-	-	-	-	-	H 81	H 81	H 81	H 81	-	-	-	-	-	-	-	-	-	-	-	-	L 9	-	-	-	-	-	-	333
TADS Compatible	M 3	-	M 9	M 9	-	-	L 3	-	-	-	H 27	M 9	M 9	-	H 27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93
Safety	M 3	-	M 9	-	-	-	L 3	H 27	-	-	-	-	-	-	-	H 27	M 9	M 9	-	-	-	-	-	-	L 3	-	L 3	-	H 27	H 27	-	L 3	-	156
Ruggedness	H 9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	H 81	H 81	-	L 9	H 81	-	-	-	-	-	H 81	-	H 81	-	-	H 81	-	486
Affordability	M 3	-	-	-	-	-	-	-	-	-	M 9	M 9	M 9	H 27	H 27	-	-	-	H 27	L 3	-	-	L 3	-	-	M 9	-	-	H 27	L 3	-	M 9	H 27	189
Reduced Wt	M 3	-	-	-	-	-	-	-	-	M 9	H 27	M 9	M 9	-	-	-	-	-	-	H 27	H 27	L 3	-	-	-	-	-	-	-	-	-	-	-	111
Target Engagement	H 9	-	L 9	H 81	-	M 27	H 81	H 81	H 81	H 81	H 81	M 27	H 81	-	H 81	-	H 81	M 27	-	-	H 81	H 81	H 81	H 81	H 81	H 81	H 81	L 9	L 9	L 9	-	-	-	1413
Sustainability	H 9	-	-	-	-	-	M 27	M 27	-	-	M 27	M 27	M 27	H 81	M 27	-	H 81	H 81	-	-	-	-	-	-	M 27	-	L 9	-	H 81	H 81	H 81	H 81	H 81	846
TOTAL		81	189	171	81	135	195	216	189	171	279	216	243	189	162	54	252	225	27	120	270	84	84	81	165	90	183	9	225	120	81	183	108	

Conference II
Designer Conference

- **Conducted 29-30 October 2002**
- **Designer Subject Matter Experts (SME)**
  National and international small arms designers
- **Purpose Statement**

"Provide a forum in which design consultants use the QFD methodology to analyze lightweight weapon system technologies, focusing on the Automatic Rifleman role in the OFW squad"

Designer Conference

What-How Relationship

Designer Conference

Engineering Concepts

Composite Materials	**Alternate Case Design** •Caseless Ammunition	**Optimum Projectile**	**Improved Propellants**	**Recoil Management** •Buffer Technology
Program Loading of Weapon Components	**Picatinny Rails**	**Optimum Barrel Selection** •Quick Change Barrel	**Early Testing** •Cold/Dust/Sand •Unlubricated Firing •Attitude (Elevation/ Depression)	**Mount Requirement**
Select Protective Coatings •Insulated Components (Rattle Reduction)	**Feed System Optimization** •Alternate Link Design •Alternative Ammunition Packaging •Alternate Feed Ammunition (Linkless)	**Design for Manufacturing & Sustainment** •Simple Reliable Mechanisms •Field Strip w/o tools •Modular Maintenance •Modular Accessories •Can Not be Mis-assembled •Maximum Use of Non-Strategic Material •Stamped/Molded Parts •Modular Renewal •Maintenance at Operator & Unit Level • Minimize Parts	**Determine & Select Optimum Rate of Fire** •Selective Fire Options •Controllability •Hit Probability	**Define Parameter Envelope For Human Factors** •Location of Controls •Non-Reflective Surfaces •Case Ejection Pattern •No Hot/Cold Flesh Points •[illegible]d Tactical
Design for Safety Considerations •Positive Blocking of Operations •Positive Safety •Must Meet "Cook-Off" Criteria •Pinch Points, sharp edges •Toxic Fumes @ Operator Location •Control of Spent Links/Cartridges/Debris •Barrel Handle	**New Equipment Training (NET)** •Early Development of Blank Firing Adaptor •Early Development of Short/Limited Range Training Ammunition			
Stand Alone System	**Muzzle Device(s)**	**Upward & Backward (New & Old) Compatibility**	**Round & Duty Monitor with Smart Chip**	**Interface with Fire Control System**

22 Concepts identified as necessary to achieve Quality Characteristics

Designer Conference

Design Matrix

- 22 Engineering Concepts evaluated as to how well they satisfied Quality Characteristics
  - Design for Manufacturing and Sustainment
  - Early Testing
  - Composite Materials
  - Determine/Select Optimum Rate of
  - Alternate Case Design
  - Recoil Management

Designer Conference

Design Matrix (cont'd)

Priority	Absolute Priority Score	Engineering Design (Concepts) → / Quality Characteristics (Design Requirements) ↓	Composite Materials	Alternate Case Design (incl. caseless)	Optimum Projectile	Improved Propellants	Recoil Management/Buffer Technology	Determine/Select Optimum Rates of Fire (Controllability/Hit Probability/Selective Fire Options)	Optimize Feed System (Case Ejection Pattern, Alternate Link Design, Alternate Ammo Packaging, Alternate Ammo Feed)	Early Testing (TOP 2-2-045, Early Dust & Sand Testing, Unlubricated Firing, Attitude Testing)	New Equipment Training (Short Range/Limited Range Training Ammo, Early Development of Blank Firing Adapter)	Design for Safety Considerations (Positive Blocking of Operation; Positive Safety; Must Meet Cook-off Criteria; Pinch Points; No Toxic Fumes @ Operator Position; Control of Spent Links & Cartridge Debris; Barrel Handle)	Muzzle Device	Upward/Backward Compatible	Round & Duty Monitor w/Smart Chip	Interface with Fire Control System	Design/Select Mount Requirements	Optimize Barrel Selection (Length, Material, Quick Change)	Select Protective Coatings (Insulated Components)	Picatinny Rails	Design for Manufacturability and Sustainability (Design for Six Sigma) (Robust Design and Processes - Maximum use of non-strategic mat'ls - stamped/molded parts - Modularity: i.e. Simple, Reliable Mechanisms; Minimize Parts; Field Strip w/o Tools; Can't be Misassembled; Modular Maint.; Modular Components; Modular Accessories; Modular Renewal; Maint. @ Operator & Unit Level)	Programmed Loading of Weapon Components (System Dynamic Testing)	Define Parameters for Human Factors (Location of Controls, Tactile Controls, No Hot/Cold Flesh Contact Points, Non-reflective Coatings)	Stand Alone System
1	279	Land Warrior/Objective Warrior Interoperability												9		9					9			
2	270	Weapon Weight {Std =<17.45}	9	3			1	1	3	3			1				3	3			9	3		
3	252	Environment	3						3	9		1					3	1	9		3	1		
4	243	Common Interface								3			3	9		3	1	1		9	1			
5	225	Durability (Jump Certified)	3				3	3	1	3		1						3	1		9			
5	225	RAM (30,000 MRBF)	3			3	1	9	9	3					9		3	3	3		9	9		
7	216	Human Factors	9				9	3	3	3		9	1			3	3	1	1		3		9	
7	216	Multi-configurable								3						3				9	9		1	
9	195	Recoil	1		1		9	3	1	1			3				3	1				3	3	
10	189	Noise Level (Blast)								1			3					1					3	
10	189	Firing Position	1						3	3		1				1	3						3	
10	189	Commonality of Parts	3				1		1	1				3						3	3			
13	183	Back-up Functions (BUIS, etc.)	1							1										3	3			9
13	183	Dry System	3	3				1		3									3			1		
15	171	Flash Reduction				1		3		1			3					1						
15	171	Portability	3	9					3	3							3	1					3	
17	165	Rate of Fire {cyclic: 850 rds/min; sustained: 85 rds/min}					9	9	3	3							1	1				9		
18	162	EST/TESS								1	9													
19	135	Silencer						3		1			3					1						
20	120	Ammunition (Weight) {600 rd combat load =<20.35 lbs}	9	9		1			3															
20	120	Round Counter - Upper and Lower Assy					1			1					9						9			
22	108	Logistics	9	9				1	1	3	3			3	3	1		3	3	1	9	3	3	
23	90	Probability of Hit P(H)	1		1	1	3	3		3	3		3			9	3	1		3		3	3	
24	84	Lethality (Probability of Incapacitation P(I))			3					1														
N/A	84	Scalable Affects (Non-lethal Capability)																						
26	81	Reduced Thermal Signature	1					3		1								1	1					
26	81	Passive Detectability	3	1					1	1							1		1					
26	81	Range {Point: 800m; Area: 800m; Grazing: 600m; Suppression: 1000m}			1	1	3	3		1						3	3	1				3	3	
26	81	Smart Chip (Accountability)					1			1					9						1			
30	54	Safety Certified								3		9			3						1	1	1	
31	27	Total Ownership Cost	1	9		1	1	1	1	3	3			3	3				3	1	9	3	3	1
N/A	9	Bayonet Capable																						
		NBC Decontamination								3									1		1			
			63	43	6	8	42	46	36	67	18	21	20	27	36	32	30	24	26	29	88	39	35	10
		Ranking	3	5	22	21	6	4	8	2	19	17	18	14	8	11	12	16	15	13	1	7	10	20

Designer Conference
Risk Assessment

- **Designer SMEs evaluated risk associated with addressing Quality Characteristics (from User Conference)**

  - ***Risk*** defined as anything that could affect implementation (e.g. technology, cost, schedule, supply chain, operations)

  - SMEs assigned risk ratings (High = 9; Medium = 3; Low = 1)

- **Risk multiplied by Absolute Priority (from Users' Requirements Matrix) yielded *Priority Relative to Risk Rating***

Designer Conference

Priority Relative to Risk

Risk X Absolute Priority = Priority Relative to Risk

Quality Characteristics

Scale:
9 - Strong
3 - Medium
1 - Weak

Customer Requirements	Customer Priority	Reduced Thermal Signature	Noise Level (Blast)	Flash Reduction	Passive Detectability	Silencer	Recoil	Human Factors	Firing Position	Portability (Basic Weapon	Land Warrior/Objective Force Warrior Interoperability	Multi-configurable	Common Interface	Commonality of Parts	EST/TESS - Training Ammo and Devices	Safety Certified	Environement	Durability (Jump Certified)	Total Ownership Cost	Ammunition (weight) {600 rd combat load <20.35 lbs}(Target 30% reduction)	Weapon Weight {Std <17.45 lbs} (Target 30% reduction)	Lethality (Probability of Incapacitation PI)	Scalable Affects (non-lethal capability)	Range {Point: 600m; Area: 800m; Grazing: 1000m; Suppression: 1000m}	Rate of Fire {cyclic: 850 rds/min; sustained: 85 rds/min}	Probability of a Hit P(H)	Back-up Functions (BUIS, etc.)	Bayonet Capable	RAM (30,000 MRBF)	Round Counter - Upper and Lower Assy	Smart Chip (Accountability)	Dry System	Logistics	NBC Decontamination	Row Totals
1. Signature	9	81	81	81	81	81			27			27													27							9			495
2. Ergonomics	9		81			27	81	81	81	81	27	27	27			27		27		81	81				27										756
3. Modularity	9										81	81	81	81													9								333
4. Compatible with TADS	3		9	9			3				27	9	9		27																				93
5. Safety	3		9				3	27								27	9	9							3		3		27	27		3			147
6. Ruggedness	9																81	81		9	81						81		81			81			495
7. Affordability	3										9	9	9	27	27				27	3			3			9			27	3		9	27		189
8. Reduced weight	3									9	27	9	9							27	27	3													111
9. Target Engagement	9		9	81		27	81	81	81	81	81	27	81		81		81	27			81	81	81	81	81	81	81	9	9	9					1413
10. Sustainability	9						27	27			27	27	27	81	27		81	81							27		9		81	81	81	81	81		846
Risk		9	9	3	1	9	3	1	1	1	9	3	1	1	1	3	3	9	3	9	9	1		1	1	1	1		9	9	9	9	1		
Absolute Priority		81	189	171	81	135	195	216	189	171	279	216	243	189	162	54	252	225	27	120	270	84	84	81	165	90	183	9	225	120	81	183	108		
Priority Relative to Risk		729	1701	513	81	1215	585	216	189	171	2511	648	243	189	162	162	756	2025	81	1080	2430	84	N/A	81	165	90	183	N/A	2025	1080	729	1647	108		

Designer Conference Key Design Elements

Key Design Elements **- 9 Quality Characteristics with highest priority relative to risk**

- Objective Force Warrior Interoperability
- Weapon Weight
- Reliability, Availability, Maintainability
- Noise Level (blast)
- Dry System (no lubrication)
- Silencer
- Durability
- Round Counter
- Ammunition Weight

- **Important in meeting performance requirements and expectations**
- **Considered big challenges**
- **Require close management, focused engineering to ensure necessary breakthroughs**

QFD Conferences

What Does It Mean?

- ***Quality Function Deployment*** **methodology used to identify:**
  - **Preliminary User requirements**
  - **Relationships and dependencies of requirements**
  - **Promising Design Concepts**
  - **Risks associated with implementing Design Concepts**
  - **Key Design Elements (high priority, challenging)**

- **All requirements are important, but QFD helps prioritize them to assist in system trade-off analysis**

QFD Conferences

What's Next?

- **Combined User/Designer Conference – August 2003**
  - **Information will feed into Trade-Off Studies and future System Integration Contract**